



# Levelized Cost of Energy

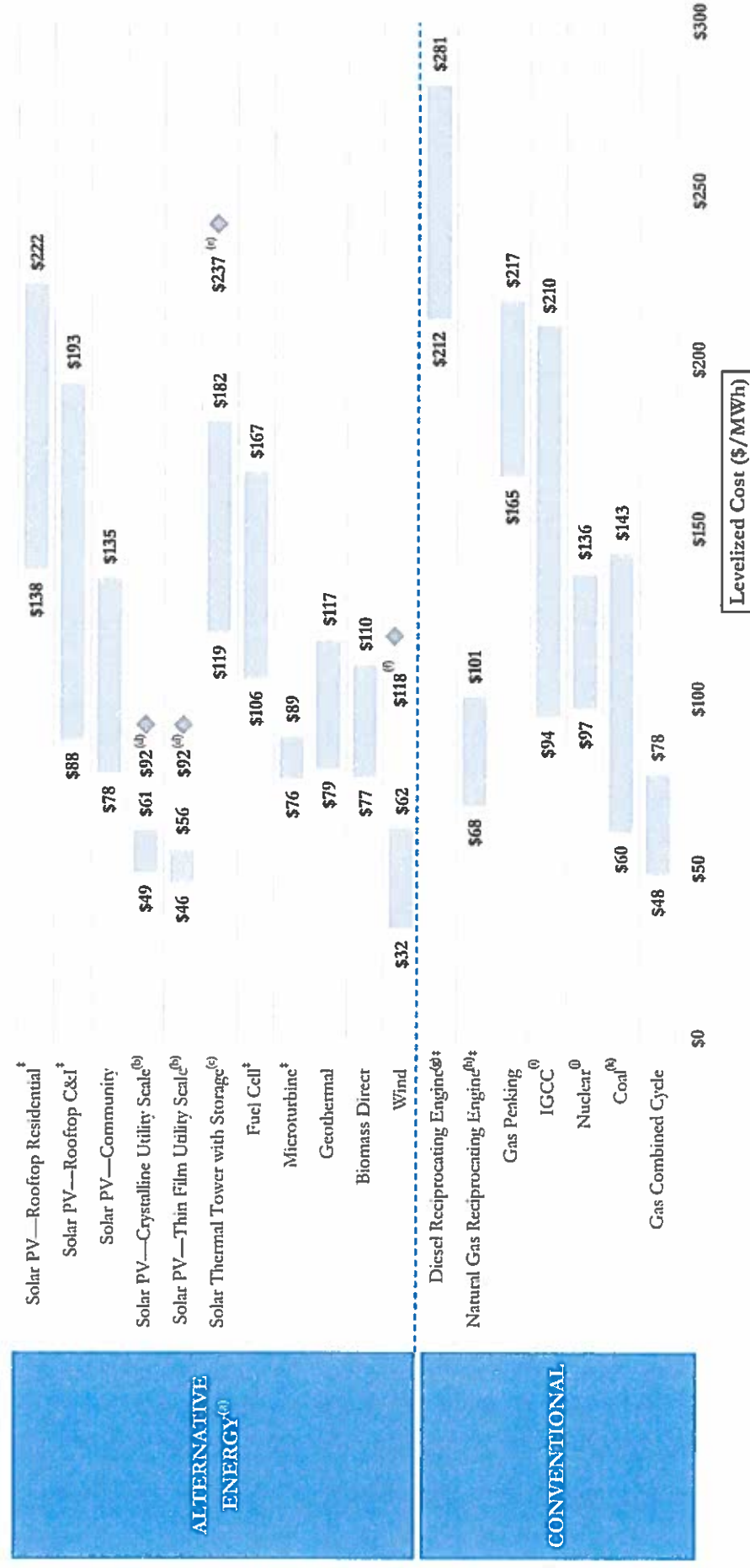
Cost comparison of unsubsidized alternative and conventional energy sources across the United States



\*Source: Lazard's Levelized Cost of Energy Analysis – Version 9.0

## Unsubsidized Levelized Cost of Energy Comparison

Certain Alternative Energy generation technologies are cost-competitive with conventional generation technologies under some scenarios; such observation does not take into account potential social and environmental externalities (e.g., social costs of distributed generation, environmental consequences of certain conventional generation technologies, etc.), reliability or intermittency-related considerations (e.g., transmission and back-up generation costs associated with certain Alternative Energy technologies)



SOURCE: Lazard estimates.

Note:

Here and throughout this presentation, unless otherwise indicated, analysis assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and Alternative Energy generation technologies. Reflects global, illustrative costs of capital, which may be significantly higher than OECD country costs of capital. See page 15 for additional details on cost of capital. Analysis does not reflect potential impact of recent draft rule to regulate carbon emissions under Section 111(d). See pages 18–20 for fuel costs for each technology. See following page for footnotes.

†

Denotes distributed generation technology.

## LAZARD'S LEVELIZED COST OF ENERGY ANALYSIS 10.0

### KEY FINDINGS

Lazard has released the tenth version of its Levelized Cost of Energy Analysis (LCOE 10.0), an in-depth study of Alternative Energy costs compared to conventional generation technologies.

The central findings of the LCOE study are: 1) certain Alternative Energy technologies are cost-competitive with conventional generation under some scenarios, although the rate of cost declines is somewhat muted in this iteration vs. over the last five years; 2) the necessity of investing in diverse generation resources for integrated electric systems for the foreseeable future; and 3) the importance of rational and transparent policies that support a modern and increasingly clean energy economy.

**1) Certain Alternative Energy technologies (e.g., wind and utility-scale solar) continue to be cost-competitive with conventional generation technologies in some scenarios, although year-on-year cost declines are less robust than in selected years past. This analysis does not take into account potential social and environmental externalities (e.g., the social costs of distributed generation, environmental consequences of conventional generation, etc.) or reliability- or intermittency-related considerations (e.g., grid investment required to manage intermittency)**

- Although the costs of all forms of utility-scale solar photovoltaic and utility-scale onshore wind have declined dramatically over the last five years, the cost profiles of such technologies have decreased relatively modestly since the last iteration of our LCOE study, potentially reflecting the intense focus among key Industry participants on developing, constructing and commissioning projects prior to various subsidy step-downs, rather than investing in technology R&D and manufacturing efficiency
- A number of leading Industry participants are beginning to develop utility-scale wind and solar “plus storage” offerings, thereby increasing capacity factors and serving grid needs not currently met by existing intermittent generation resources. We have included a preliminary analysis of the levelized cost of one such illustrative future offering, which compares favorably to its nearest competition, solar thermal with storage
- The levelized cost of rooftop (both residential and commercial/industrial) solar PV has declined significantly over recent years, driven by more efficient installation techniques and improved supply chains. While rooftop technologies are likely inherently higher cost than utility-scale technologies (as a result of small scale, installation complexity, etc.), the value associated with certain uses of rooftop solar PV by sophisticated commercial/industrial users (e.g., demand charge management, etc.) may exceed, under some circumstances, even this relatively elevated cost profile. Recent investment by incumbent utilities in the suite of technologies that could potentially capture these value streams weighs in favor of such an interpretation
- Very large-scale conventional and renewable generation projects (e.g., IGCC, nuclear, solar thermal, etc.) continue to face a number of challenges, including significant cost

contingencies, high absolute costs, competition from relatively cheap natural gas in some geographies, operating difficulties and policy uncertainty

**2) Despite the sustained and growing cost-competitiveness of certain Alternative Energy technologies, advanced economies will require diverse generation fleets to meet baseload generation needs for the foreseeable future. The optimal solution for many regions is to use Alternative Energy technologies as a complement to existing conventional generation technologies**

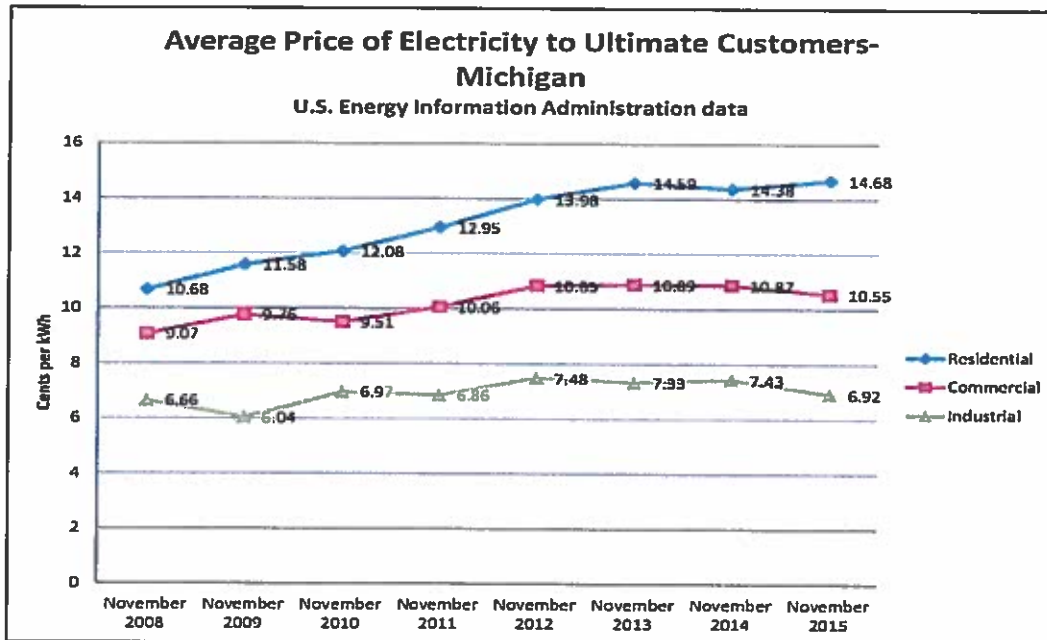
- The U.S. (and integrated electric systems globally) will continue to benefit from a balanced generation mix, including a combination of Alternative Energy and conventional generation technologies
- While some Alternative Energy technologies have achieved notional “grid parity” under certain conditions (e.g., best-in-class wind/solar resources), such observation does not take into account potential social and environmental externalities (e.g., social costs of distributed generation, environmental consequences of conventional generation, etc.) or integration- and reliability-related considerations

**3) The current dynamic of energy costs has important ramifications for the Industry, policymakers and the public. In the U.S., a coordinated federal and state energy policy, grounded in cost analysis, could enable smarter energy development, leading to sustainable energy independence, a cleaner environment and a stronger economic base—alternatively, policy actions that are not grounded in cost analysis (or that are unduly political) may thwart such objectives**

- Alternative Energy costs have decreased dramatically in the past six years, driven in significant part by federal subsidies and related financing tools, and the resulting economies of scale in manufacturing and installation. While a number of these subsidies have been extended, they are expected to step down over the medium-term and thereafter permanently expire. A key question for Industry participants will be whether these technologies can continue their cost declines and achieve wider adoption without the benefit of subsidies in the future
- The public narrative surrounding Alternative Energy has in recent months focused on Alternative Energy as an inefficient “threat” to conventional technologies and related industries, fueled in part by political and campaign rhetoric emphasizing the production and use of coal and natural gas and hostile to governmental involvement in energy markets (notwithstanding the historical and necessary involvement of government in such markets). However, our analysis and Industry perspective indicate that robust, modern and sustainable electricity systems must combine low-cost renewables with baseload conventional technologies

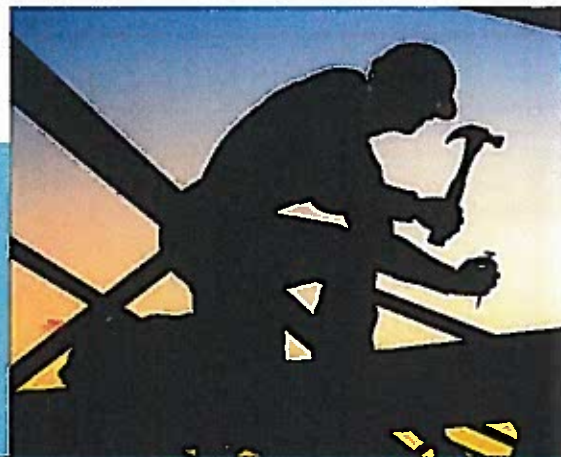
## UCPB Case Intervention Results and Suggested Changes to PA 304

1. The Michigan Utility Consumer Participation Board was created by Act 304, P.A. of 1982, (Section 460.61 of the Michigan Compiled Laws). The five-member Board provides grants to qualified applicants representing the interests of Michigan's residential energy (gas, electric, and other fuel) utility customers at residential energy proceedings before the Michigan Public Service Commission. Funding is generated through annual assessments of certain regulated utility companies into the Utility Consumer Representation Fund (UCRF).
2. Since 2008, residential electricity rates in Michigan have increased by nearly 38% (as shown below):



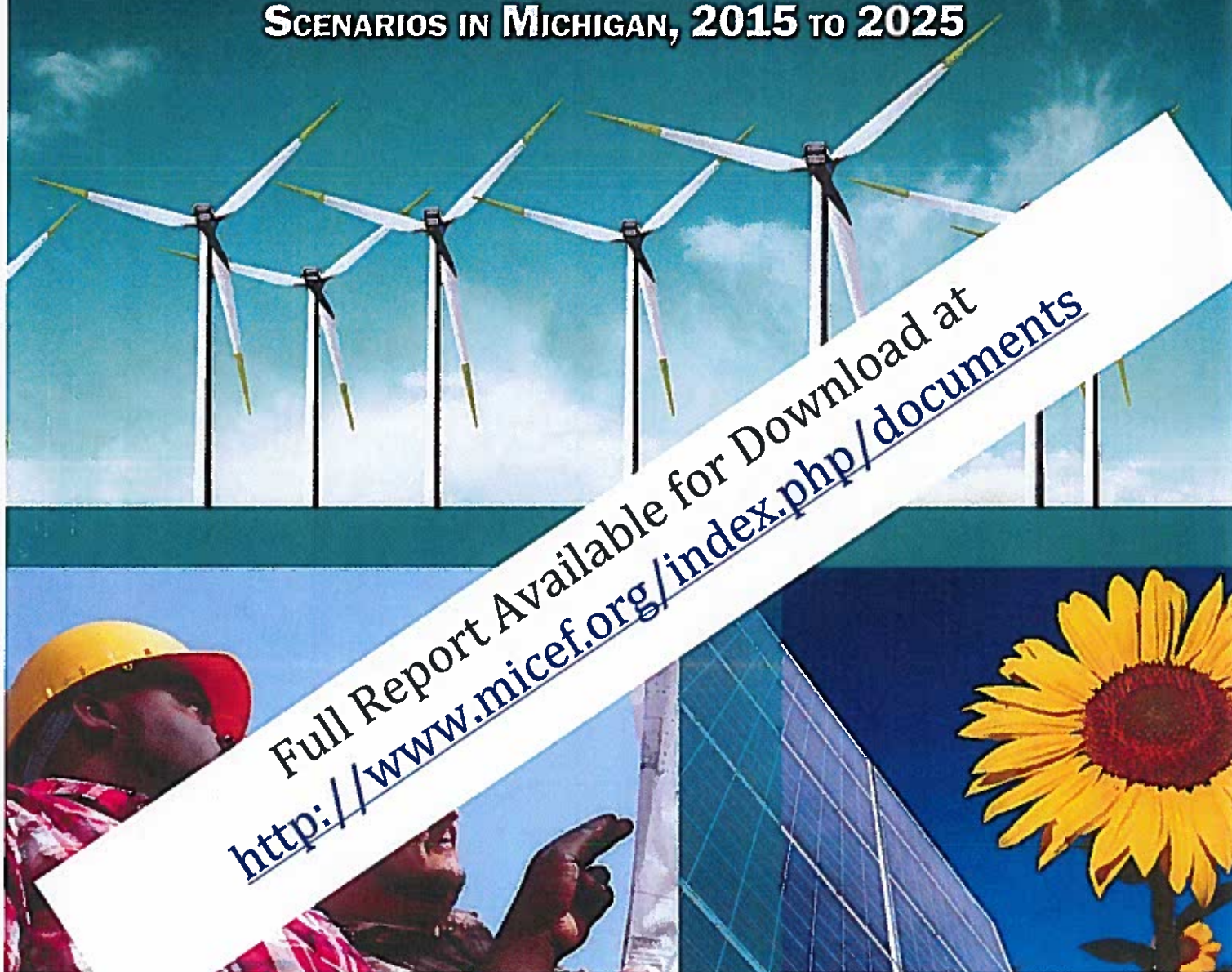
3. Over the past five years, the UCPB and its grantees have saved residential and other ratepayers hundreds of millions of dollars by challenging electric and gas utility assumptions in rate cases. The board regularly achieves Benefit/Cost ratios ranging from several hundred to 1, to several thousand to 1 on contributions to the UCRF which funds these interventions.
4. Under Act 304 the UCPB and its grantees may intervene in Power Supply Cost Recovery (PSCR) Plan and Reconciliation cases, General Rate cases and Renewable Energy cases. Allowable issues include: fuel supply, emissions-related variable costs, variable costs of generation, transmission costs, line losses (General Rate cases only), depreciation (Renewable Energy cases only), net market purchase and sales expense, market and fuel price projections, sales projections, and generating unit dispatch.
5. The UCPB seeks to increase funding from approximately \$750,000 per year to \$1.5 million annually to more fully participate in these cases, and to support participation in additional cases including: Return on Equity, Depreciation, Integrated Resource Planning (IRP), and Cost of Service issues. This would cost each residential ratepayer less than 3 cents per month.





## **ECONOMIC IMPACT OF TWO RENEWABLE PORTFOLIO STANDARD SCENARIOS IN MICHIGAN, 2015 TO 2025**

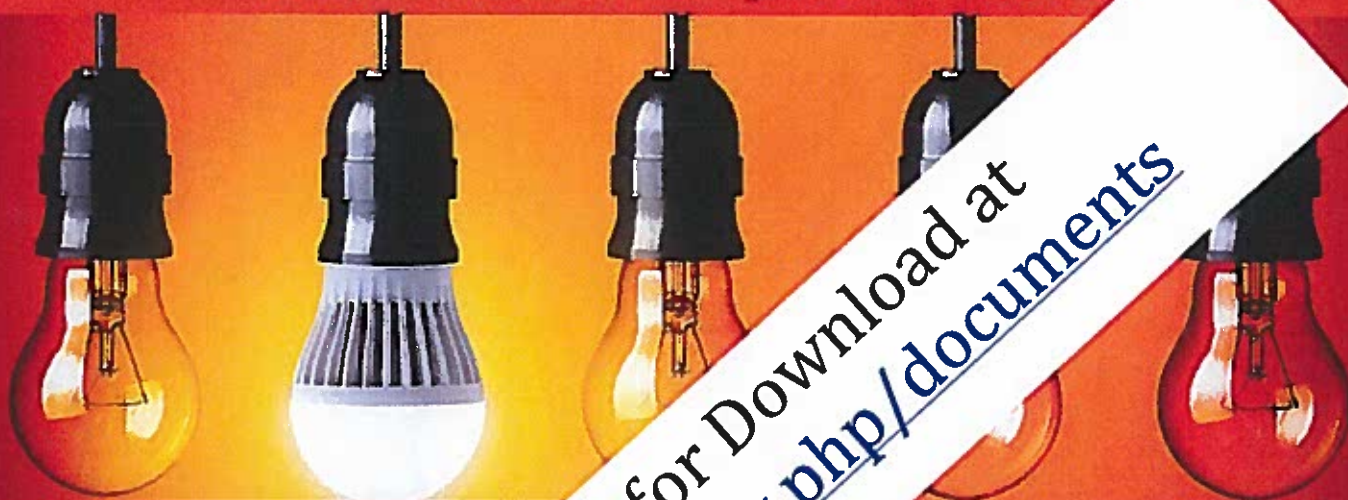
Full Report Available for Download at  
<http://www.micef.org/index.php/documents>



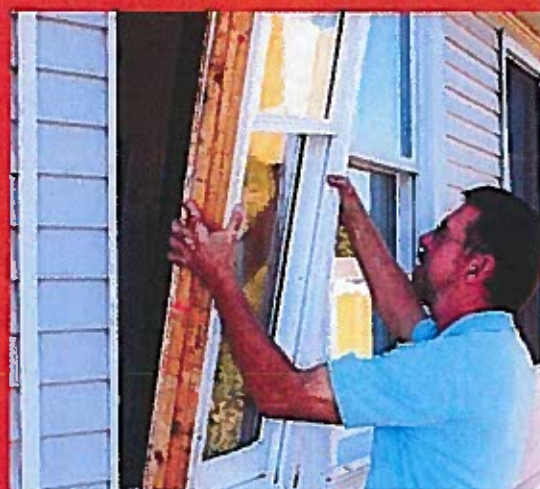




## **ECONOMIC IMPACT OF ENERGY OPTIMIZATION PROGRAM SCENARIOS IN MICHIGAN, 2014 TO 2023**



Full Report Available for Download at  
<http://www.micef.org/index.php/documents>



**Guest Commentary**

# Electricity ratepayers bear heavier burden in Michigan



November 9, 2016



Larry Ward is executive director Michigan Conservative Energy Forum in Lansing.

The debate about Michigan's energy future is heating up again in Lansing – and Gov. Rick Snyder has said keeping costs low is a top priority. The Michigan Conservative Energy Forum(MCEF) wholeheartedly agrees that Michigan should have the most affordable energy mix possible.

We also believe accountability is important at a time when there are more lobbyists than lawmakers helping shape our energy laws. That's why we've studied Michigan's current energy situation and stacked it up against the governor's goals in a new analysis. This data is not easily discoverable for ratepayers and, as a result, MCEF will continue generating this electricity rate report card to hold our utilities accountable.

Because when it comes to cost, the fact is, Michigan just doesn't stack up.

The latest data show Michigan has some of the highest electricity rates in the Midwest. Michigan ratepayers, including families and small businesses, continue to be saddled with ever-increasing electricity bills.

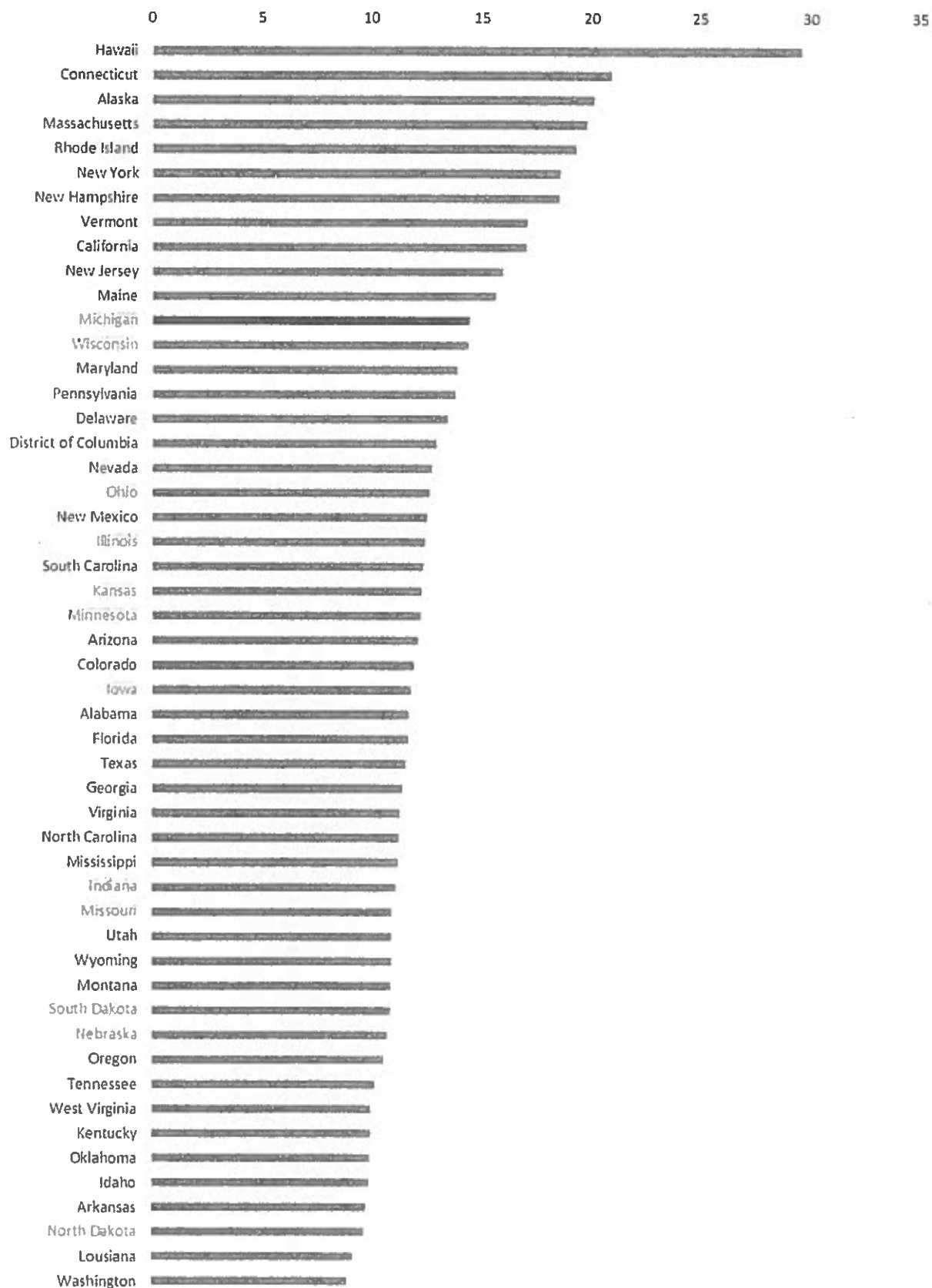
Electricity bills have many components, including fixed monthly charges, charges based on the customer's peak rate of power usage and charge per kilowatt hour used. The most meaningful measure of electricity costs is what we pay for the electricity we use.

The MCEF analysis uses publicly available data from the Energy Information Administration of the U.S. Department of Energy, which collects monthly data from each utility in each state on the amounts of electricity sold and revenue from these sales, divided into different classes. For our analysis, we focused on the cost of electricity for residential users. Calendar year 2015 is the most recent complete year for available data, so we compared electricity costs in the various states in terms of cents per kWh.



# Residential Rate Report Card

2015 Average Cost per kWh - Residential



Data Source: <http://www.eia.gov/electricity/data/browser>

Let's further analyze a breakdown of costs for the three key categories of energy users: residential, commercial and industrial customers.

### **Residential customers**

Michigan families deserve a fair price for the electricity they use. Unfortunately, as the Report Card demonstrates, we found that Michigan ratepayers are the hardest-hit among all customer classes in our state. Michigan has the highest residential electricity costs in the Midwest. Nationally, Michigan has the 12th-highest residential electricity rates. Rather than having extra money in their pockets, families are stuck footing the bill for an outdated energy infrastructure.

### **Commercial customers**

Small businesses are fundamental to Michigan's economy, and they need access to affordable electricity to grow and flourish. Businesses in Michigan are not getting a good deal on their electricity costs. In fact, Michigan has the second highest commercial customer cost for electricity in the Midwest and 17th-highest in the nation. When businesses are looking to invest in our state, the high cost of electricity can be a major disincentive.

### **Industrial customers**

In order to boost Michigan's economy and attract industry and 21st-Century manufacturing jobs back to our state, we need competitive electricity prices for industrial users.

In relative terms, when considering Michigan's poor track record on electricity costs, industrial users get the best deal for electricity – but not by much. Our state has the sixth-highest average electricity costs for industrial users in the Midwest and the 21st-highest in the nation. Simply put, we have much room for improvement in controlling costs for industrial users so they are able to expand their operations, instead of scaling them back or moving them to other states.

The fact is, ratepayers across our state are getting a raw deal for their electricity. There is tremendous room for improvement from our utilities, and it should be their job to control costs and give Michigan energy users the best deal they can.

That process starts with big utility companies making investments today that modernize our infrastructure, diversify generation to include more renewables, and leverage the latest technology to put Michigan back on track for reliable, affordable utility service for years to come. We urge our lawmakers to keep cost at the top of their list of priorities as they continue to update Michigan's energy laws.

## Conservative Energy Forum on state's electricity: Not many sparks

December 9, 2016

Larry Ward is executive director of the Michigan Conservative Energy Forum in Lansing.

Last month, the Michigan Conservative Energy Forum (MCEF) released its inaugural Electricity Rate Report Card, which showed that Michigan ratepayers face the highest electricity costs in the Midwest. In our ongoing effort to maintain accountability of Michigan's electric utility companies, we are now releasing the second installment – our Reliability and Natural Resources Report Card.

### Reliability

Electricity reliability is crucial for all energy users in Michigan and a key component of Gov. Snyder's energy priorities. The best way to measure electricity reliability is the average number of minutes each electricity customer goes without power during an outage.

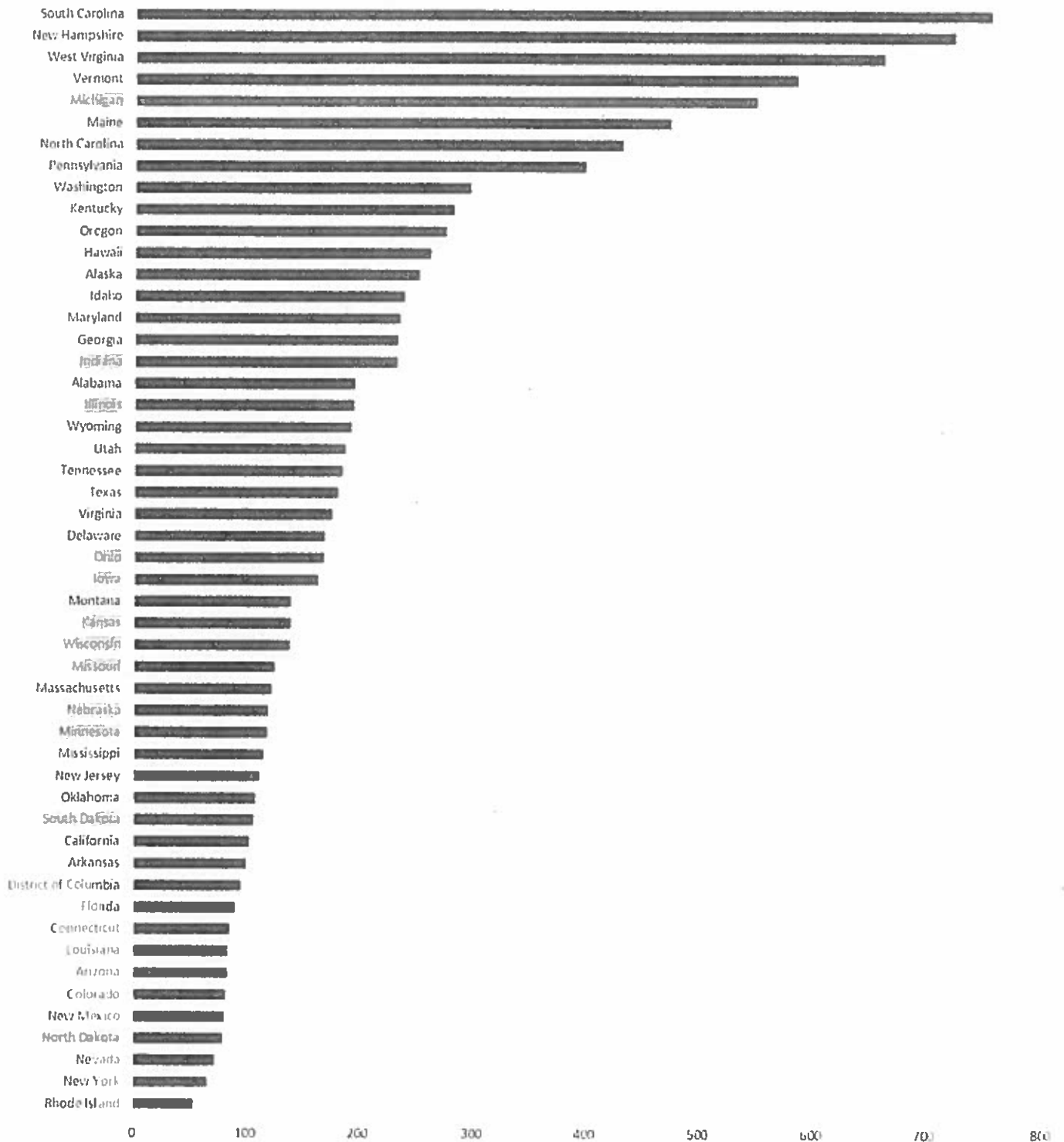
The Energy Information Administration of the U.S. Department of Energy began collecting annual outage data from utilities and publishing this information in 2013. The most recent complete reliability data, from calendar year 2014, shows Michigan is simply missing the mark when it comes to reliability.

Michigan has the worst power outage time per customer in the Midwest and the fifth-worst in the nation. This means on average, Michigan electricity ratepayers lose power longer than customers in every other Midwest state.



# Electricity Reliability Report Card

Minutes Outage per Customer in 2014



Data Source: <http://www.eia.gov/electricity/data/eia861/>

Much of the debate over reliability has focused on resource adequacy, or the amount of power generation needed to meet customers' peak demand. However, MCEF contends it is wrong to view reliability through the lens of resource adequacy given that in 2014 loss of electricity because of problems related to resource

adequacy accounted for only about 1 percent of outage minutes in Michigan. Thus an overwhelming majority of regular power outages are not caused by insufficient electricity generation, but rather by breakdowns in the electricity delivery system.

When it comes to reliability, it is clear that Michigan utility companies are falling short. And, considering the rates we pay, our utility companies owe it to ratepayers to improve infrastructure to keep the lights on.

### **Conservation of natural resources**

We must protect our natural resources, producing and using energy in ways that have the minimum negative impact on our air, land, and water quality. Electric utilities are required to report emissions of the most dangerous pollutants from each power plant. As with reliability information, the most recent emissions data available from the EIA is for calendar year 2014.

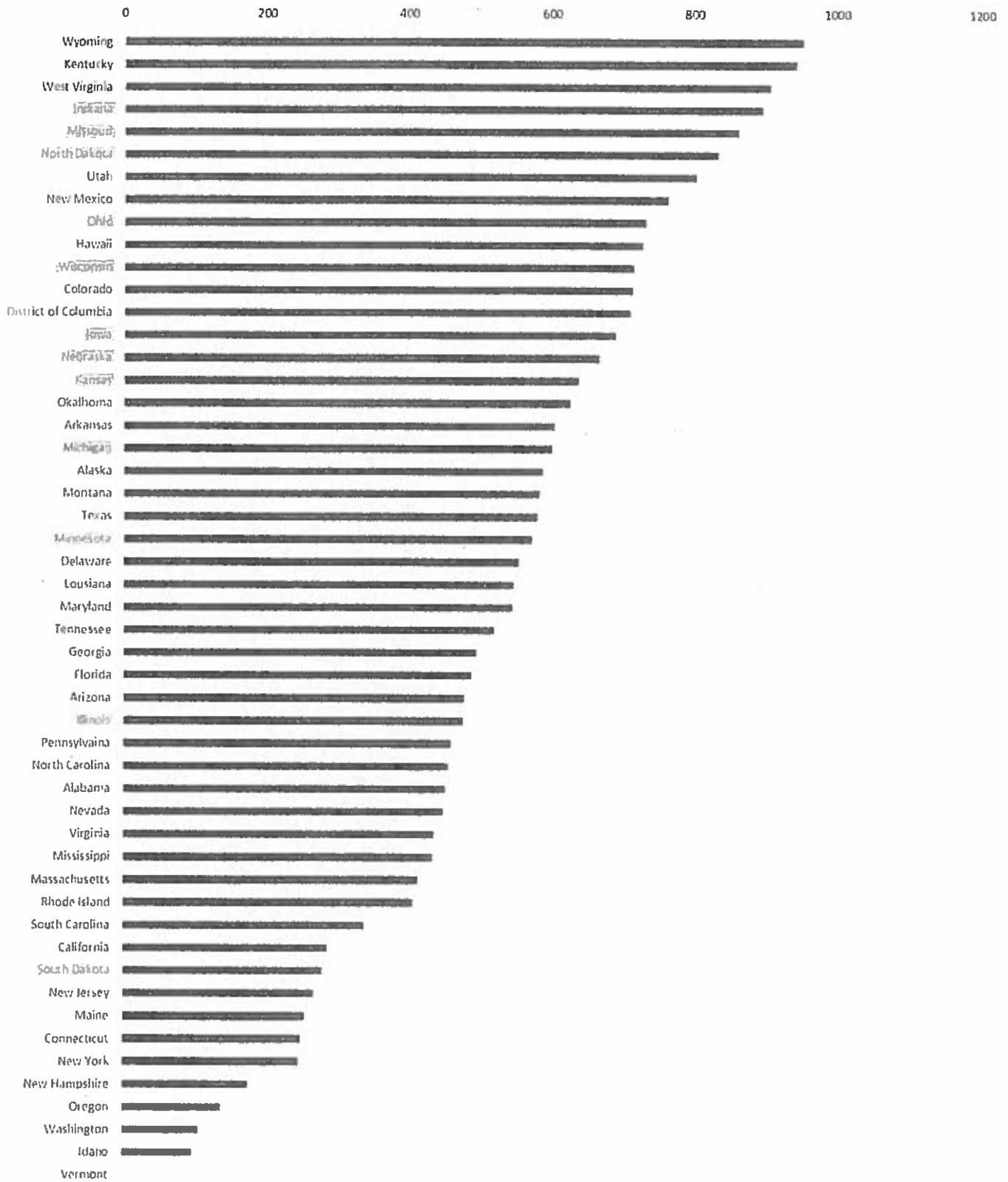
The best way to measure emissions is the amount of pollution compared to the amount of power generated. For our analysis we used tons of pollution per million kWh of electricity generated.

In terms of carbon dioxide emissions, a key contributor to pollution that causes negative health effects, Michigan ranked ninth-worst in the Midwest and 19th-worst in the nation. For sulfur dioxide emissions, another key pollutant that has been linked to higher rates of asthma, cardiopulmonary diseases, and acid rain, Michigan ranked fourth-worst in the Midwest and fifth-worst in the nation.

Pollution threatens our Great Lakes, rivers and streams, in turn threatening Michigan's proud traditions of fishing, hunting, boating and enjoying the outdoors. Many states are reducing pollution by incorporating more clean energy sources into their energy portfolios.

# Natural Resources Report Card

Metric Tons Carbon Dioxide Emissions per million kWh Electricity Generated in 2014



Data Source: [http://www.eia.gov/electricity/data/state/emission\\_annual.xls](http://www.eia.gov/electricity/data/state/emission_annual.xls)



In 2015, Michigan ranked 5th lowest in the Midwest in terms of the percentage of power generation from renewable sources, and 20th lowest in the nation.

Investing in clean, renewable energy can position Michigan as an energy leader, conserving our finite natural resources and improving reliability. Take Michigan's 2008 renewable energy standard (RES) for example, which helped to create jobs, drive investment in our state, and protect our natural resources.

Building on this success, part of the energy legislation now being considered by the House – a five percent increase to our RES by 2021 – was sponsored by Sen. Dale Zorn, R-Monroe, and has already been approved with bipartisan support by the GOP-led state Senate.

The state House can help Michigan meet Gov. Snyder's goals of conservation and reliable, affordable energy by voting to increase our renewable energy standard. As the country moves toward a 21st century clean energy economy, MCEF urges our lawmakers to place ratepayers above guaranteed utility profits, and keep reliability and conservation in mind as they consider the current energy bills before them.

MCEF will continue to provide these performance rate cards, and we are committed to helping Michigan be a leader in our nation's clean energy transition.